



**ALPHA & OMEGA**  
SEMICONDUCTOR

# ***AOS Semiconductor Product Reliability Report***

**AO4840E**, rev B

**Plastic Encapsulated Device**

**ALPHA & OMEGA Semiconductor, Inc**

**[www.aosmd.com](http://www.aosmd.com)**

Mar, 2018

This AOS product reliability report summarizes the qualification result for AO4840E. Accelerated environmental tests are performed on a specific sample size, and then followed by electrical test at end point. Review of final electrical test result confirms that AO4840E passes AOS quality and reliability requirements. The released product will be categorized by the process family and be routine monitored for continuously improving the product quality.

## I. Reliability Stress Test Summary and Results

| Test Item                | Test Condition  | Time Point                | Total Sample Size | Number of Failures | Reference Standard |
|--------------------------|---|---------------------------|-------------------|--------------------|--------------------|
| HTGB                     | Temp = 150°C ,<br>Vgs=100% of Vgsmax                    | 168 / 500 /<br>1000 hours | 462 pcs           | 0                  | JESD22-A108        |
| HTRB                     | Temp = 150°C ,<br>Vds=100% of Vdsmax                    | 168 / 500 /<br>1000 hours | 462 pcs           | 0                  | JESD22-A108        |
| Precondition<br>(Note A) | 168hr 85°C / 85%RH +<br>3 cycle reflow@260°C<br>(MSL 1) | -                         | 4620 pcs          | 0                  | JESD22-A113        |
| HAST                     | 130°C , 85%RH,<br>33.3 psia,<br>Vds = 80% of Vdsmax     | 96 hours                  | 693 pcs           | 0                  | JESD22-A110        |
| H3TRB                    | 85°C , 85%RH,<br>Vds = 80% of Vdsmax                    | 1000 hours                | 693 pcs           | 0                  | JESD22-A101        |
| Autoclave                | 121°C , 29.7psia,<br>RH=100%                            | 96 hours                  | 924 pcs           | 0                  | JESD22-A102        |
| Temperature<br>Cycle     | -65°C to 150°C ,<br>air to air,                         | 1000cycles                | 924 pcs           | 0                  | JESD22-A104        |
| HTSL                     | Temp = 150°C  | 1000 hours                | 693 pcs           | 0                  | JESD22-A103        |
| IOL                      | Δ Tj = 100°C  | 15000 cycles              | 693 pcs           | 0                  | AEC Q101           |

**Note:** The reliability data presents total of available generic data up to the published date.

Note A: MSL (Moisture Sensitivity Level) 1 based on J-STD-020

## II. Reliability Evaluation

**FIT rate (per billion): 3.82**

**MTTF = 29919 years**

The presentation of FIT rate for the individual product reliability is restricted by the actual burn-in sample size. Failure Rate Determination is based on JEDEC Standard JESD 85. FIT means one failure per billion hours.

**Failure Rate** =  $\text{Chi}^2 \times 10^9 / [2 (N) (H) (Af)] = 3.82$

**MTTF** =  $10^9 / \text{FIT} = 29919 \text{ years}$

**Chi<sup>2</sup>** = Chi Squared Distribution, determined by the number of failures and confidence interval

**N** = Total Number of units from burn-in tests

**H** = Duration of burn-in testing

**Af** = Acceleration Factor from Test to Use Conditions (Ea = 0.7eV and Tuse = 55°C)

Acceleration Factor [**Af**] =  $\text{Exp} [Ea / k (1/Tj u - 1/Tj s)]$

**Acceleration Factor ratio list:**

|           | 55 deg C   | 70 deg C  | 85 deg C  | 100 deg C | 115 deg C   | 130 deg C   | 150 deg C |
|-----------|------------|-----------|-----------|-----------|-------------|-------------|-----------|
| <b>Af</b> | <b>259</b> | <b>87</b> | <b>32</b> | <b>13</b> | <b>5.64</b> | <b>2.59</b> | <b>1</b>  |

**Tj s** = Stressed junction temperature in degree (Kelvin), K = C+273.16

**Tj u** = The use junction temperature in degree (Kelvin), K = C+273.16

**k** = Boltzmann's constant,  $8.617164 \times 10^{-5} \text{ eV / K}$